As Cervantes wrote in Don Quixote, "There are but two families in the world.....the Haves and the Have-nots." We can be sure that the world will always include the Haves — those who can communicate, those who are successful in the world economy.

But we are concerned that every day, everywhere in the world, more people are added to the family of the Have-nots. Through modern communications we can begin to end the division of the world into two separate, non-communicating families. We can bring a real hope of progress to people now isolated from the rest of the world.

The great Argentine writer Jorge Luis Borges wrote a story called The Library of Babel in which he compared the universe to a library. In his characteristically dark manner, he wrote that even if "the human species" were "extinguished, ... the Library would endure: illuminated, solitary, infinite, perfectly motionless, equipped with precious volumes, useless, incorruptible, secret."

Today, that Library is the world of modern knowledge, created and built by communication. It is accessible through telephone links and computers. It is usable through the information infrastructure. This Library, this world of modern knowledge, has the potential to make its users far better off than they are today. Yet, in the words of Borges, that Library is "solitary" and "useless" for everyone in the world who lacks modern means of communication.

Access to Borges' Library for all communities, for all the Macondos of the world, must begin with the discovery of the humble rare tropical ice of the telephone.

We should commit here to hastening this discovery. Our mission is imperative and crucial, because, as Garcia Marquez wrote in the very last line of his great novel, communities "condemned to one hundred years of solitude [do] not have a second opportunity on earth."

We know that millions alive today have no second opportunity to participate in the world economy and the world community.

By grace of human genius, we know how to give them that opportunity. By our efforts in this conference, let us not fail them. Let us everywhere bring isolation to an end through the miracle of telecommunications.

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REGULATION, ECONOMICS AND LAW TEXT

TEXT OF SPEECH BY VICE PRESIDENT AL GORE PREPARED FOR DELIVERY MARCH 21 AT THE INTERNATIONAL TELECOMMUNICATIONS UNION MEETING IN BUENOS AIRES, ARGENTINA (TEXT)

Remarks prepared for delivery
By Vice President AL GORE
International Telecommunications Union
Monday March 21, 1994

I have come here, 8,000 kilometers from my home, to ask you to help create a Global Information Infrastructure. To explain why, I want to begin by reading you something that I first read in high school, 30 years ago.

"By means of electricity, the world of matter has become a great nerve, vibrating thousands of miles in a breathless point of time.... The round globe is a vast ... brain, instinct with intelligence!"

This was not the observation of a physicist — or a neurologist. Instead, these visionary words were written in 1851 by Nathaniel Hawthorne, one of my country's greatest writers, who was inspired by the development of the telegraph. Much as Jules Verne foresaw submarines and moon landings, Hawthorne foresaw what we are now poised to bring into being.

The ITU was created only 14 years later, in major part for the purpose of fostering an internationally compatible system of telegraphy.

For almost 150 years, people have aspired to fulfill Hawthorne's vision—to wrap nerves of communications around the globe, linking all human knowledge.

In this decade, at this conference, we now have at hand the technological breakthroughs and economic means to bring all the communities of the world together. We now can at last create a planetary information network that transmits messages and images with the speed of light from the largest city to the smallest village on every contingent.

I am very proud to have the opportunity to address the first development conference to the ITU because the President of the United States and I believe that an essential prerequisite to sustainable development, for all members of the human family, is the creation of this network of networks. To accomplish this purpose, legislators, regulators, and business-people must do this: build and operate a Global Information Infrastructure. This GII will circle the globe with information superhighways on which all people can travel.

These highways—or, more accurately, networks of distributed intelligence—will allow us to share information, to connect, and to communicate as a global community. From these connections we will derive robust and sustainable economic progress, strong democracies, better solutions to global and local environmental challenges, improved health care, and—ultimately—a greater sense of shared stewardship of our small planet.

The Global Information Infrastructure will help educate our children and allow us to exchange ideas in within a community and among nations. It will be a means by which families and friends will transcend the barriers of time and distance. It will make possible a global information marketplace, where consumers can buy or sell products. I ask you, the delegates to this conference, to set an ambitious agenda that will help all governments, in their own sovereign nations and in international cooperation, to build this Global Information Infrastructure. For my country's part, I pledge our vigorous, continued participation in achieving this goal—in the development sector of the ITU, in other sectors and in plenipotentiary gatherings of the ITU, and in bilateral discussions held by our Departments of State and Commerce and our Federal Communications Commission.

The development of the GII must be a cooperative effort among governments and peoples. It cannot be dictated or built by a single country. It must be a democratic effort.

And the distributed intelligence of the GII will spread participatory democracy.

To illustrate why, I'd like to use an example from computer science. In the past, all computers were huge mainframes with a single processing unit, solving problems in sequence, one by one, each bit of information sent back and forth between the CPU and the vast field of memory surrounding it. Now, we have massively parallel computers with hundreds — or thousands — of tiny self- contained processors distributed throughout the memory field, all interconnected, and together far more powerful and more versatile than even the most sophisticated single processor, because they each solve a tiny piece of the problem simultaneously and when all the pieces are assembled, the problem is solved.

Similarly, the GII will be an assemblage of local, national, and regional networks, that are not only like parallel computers but in their most advanced state will in fact be a distributed, parallel computer.

In a sense, the GII will be a metaphor for democracy itself. Representative democracy does not work with an all-powerful central government, arrogating all decisions to itself. That is why communism collapsed.

Instead, representative democracy relies on the assumption that the best way for a nation to make its political decisions is for each citizen — the human equivalent of the self-contained processor — to have the power to control his or her own life.

To do that, people must have available the information they need. And be allowed to express their conclusions in free speech and in votes that are combined with those of millions of others. That's what guides the system as a whole.

The GII will not only be a metaphor for a functioning democracy, it will in fact promote the functioning of democracy by greatly enhancing the participation of citizens in decision-making. And it will greatly promote the ability of nations to cooperate with each other. I see an new Athenian Age of democracy forged in the fora the GII will create.

The GII will be the key to economic growth for national and international economies. For us in the United States, the information infrastructure already is to the U.S. economy of the 1990s what transport infrastructure was to the economy of the mid-20th century. The integration of computing and information networks into the economy makes U.S. manufacturing companies more productive, more competitive, and more adaptive to changing conditions and it will do the same for the economies of other nations.

These same technologies are also enabling the service sectors of the U.S. economy to grow, to increase their scale and productivity and expand their range of product offerings and ability to respond to customer demands.

Approximately 60% of all U.S. workers are "knowledge workers" — people whose jobs depend on the information they generate and receive over our information infrastructure. As we create new jobs, 8 out of 10 are in information-intensive sectors of our economy. And these new jobs are well-paying jobs for financial analysts, computer programmers, and other educated workers.

The global economy also will be driven by the growth of the Information Age. Hundreds of billions of dollars can be added to world growth if we commit to the GII. I fervently hope this conference will take full advantage of this potential for economic growth, and not deny any country or community its right to participate in this growth.

As the GII spreads, more and more people realize that information is a treasure that must be shared to be valuable. When two people communicate, they each can be enriched—and unlike traditional resources, the more you share, the more you have. As Thomas Jefferson said, "He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me."

Now we all realize that, even as we meet here, the Global Information Infrastructure is being built, although many countries have yet to see any benefits.

Digital telecommunications technology, fiber optics, and new high-capacity satellite systems are transforming telecommunications. And all over the world, under the seas and along the roads, pipelines, and railroads, companies are laying fiber optic cable that carries thousands of telephone calls per second over a single strand of glass.

These developments are greatly reducing the cost of building the GII. In the past, it could take years to build a network. Linking a single country's major cities might require laying thousands of kilometers of expensive wires. Today, a single satellite and a few dozen ground stations can be installed in a few months — at much lower cost.

The economics of networks have changed so radically that the operation of a competitive, private market can build much of the GII. This is dependent, however, upon sensible regulation.

Within the national boundaries of the U.S. we aspire to build our information highways according to a set of principles that I outlined in January in California. The National Information Infrastructure, as we call it, will be built and maintained by the private sector. It will consist of hundreds of different networks, run by different companies and using different technologies, all connected together in a giant "network of networks," providing telephone and interactive digital video to almost every American.

Our plan is based on five principles: First, encourage private investment; Second, promote competition; Third, create a flexible regulatory framework that can keep pace with rapid technological and market changes; Fourth, provide open access to the network for all information providers; and Fifth, ensure universal service.

Are these principles unique to the United States? Hardly. Many are accepted international principles endorsed by many of you. I believe these principles can inform and aid the development of the Global Information Infrastructure and urge this Conference to incorporate them, as appropriate, into the Buenos Aires Declaration, which will be drafted this week.

Let me elaborate briefly on these principles.

First, we propose that private investment and competition be the foundation for development of the GII. In the U.S., we are in the process of opening our communications markets to all domestic private participants.

In recent years, many countries, particularly here in Latin America, have opted to privatize their state-owned telephone companies in order to obtain the benefits and incentives that drive competitive private enterprises, including innovation, increased investment, efficiency and responsiveness to market needs.

Adopting policies that allow increased private sector participation in the telecommunications sector has provided an enormous spur to telecommunications development in dozens of countries, including Argentina, Venezuela, Chile, and Mexico. I urge you to follow their lead.

But privatization is not enough. Competition is needed as well. In the past, it did make sense to have telecommunications monopolies.

In many cases, the technology and the economies of scale meant it was inefficient to build more than one network. In other cases—Finland, Canada, and the U.S., for example—national networks were built in the early part of this century by hundreds of small, independent phone companies and cooperatives.

Today, there are many more technology options than in the past and it is not only possible, but desirable, to have different companies running competing—but interconnected networks, because competition is the best way to make the telecommunications sector more efficient, more innovative—and more profitable as consumers make more calls and prices decline.

That is why allowing other companies to compete with AT&T, once the world's largest telephone monopoly, was so useful for the United States. Over the last ten years, it has cut the cost of a long-distance telephone call in the U.S. more than 50%.

To promote competition and investment in global telecommunications, we need to adopt cost-based collection and accounting rates. Doing so will accelerate development of the GII.

International standards to ensure interconnection and interoperability are needed as well. National networks must connect effectively with each other to make real the simple vision of linking schools, hospitals, businesses, and homes to a Global Information Infrastructure.

Band in hand with the need for private investment and competition is the necessity of appropriate and flexible regulations developed by an authoritative regulatory body.

In order for the private sector to invest and for initiatives opening a market to competition to be successful, it is necessary to create a regulatory environment that fosters and protects competition and private sector investments, while at the same time protecting consumers' interests.

Without the protection of an independent regulator, a potential private investor would be hesitant to provide service in competition with the incumbent provider for fear that the incumbent's market power would not be adequately controlled.

Decisions and the basis for making them must also be made public so that consumers and potential competitors are assured that their interests are being protected.

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This is why in the U.S., we have delegated significant regulatory powers to an independent agency, the Federal Communications Commission. This expert body is well-equipped to make difficult technical decisions and to monitor, in conjunction with the National Telecommunications and Information Administration and the Department of Justice, changing market conditions. We commend this approach to you.

We need a flexible, effective system for resolution of international issues, too—one that can keep up with the over-accelerating pace of technological change.

I understand that the ITU has just gone through a major reorganization designed to increase its effectiveness. This will enable the ITU, under the able leadership of Mr. Tarjanne, to streamline its operations and redirect resources to where they are needed most. This will ensure that the ITU can adapt to future and unimaginable technologies.

Our fourth principle is open access. By this I mean that telephone and video network owners should charge nondiscriminatory prices for access to their networks. This principle will guarantee every user of the GII can use thousands of different sources of information—video programming, electronic newspapers, computer bulletin boards—from every country, in every language.

With new technologies like direct broadcast satellites, a few networks will no longer be able to control your access to information—as long as government policies permit new entrants into the information marketplace.

Countries and companies will not be able to compete in the global economy if they cannot get access to up-to-date information, if they cannot communicate instantly with customers around the globe. Ready access to information is also essential for training the skilled workforce needed for high-tech industries.

The countries that flourish in the twenty-first century will be those that have telecommunications policies and copyright laws that provide their citizens access to a wide choice of information services. Protecting intellectual property is absolutely essential.

The final and most important principle is to ensure universal service so that the Global Information Infrastructure is available to all members of our societies. Our goal is a kind of global conversation, in which everyone who wants can have his or her say.

We must ensure that whatever steps we take to expand our worldwide telecommunications infrastructure, we keep that goal in mind.

Although the details of universal service will vary from country to country and from service to service, several aspects of universal service apply everywhere. Access clearly includes making service available at affordable prices to persons at all income levels. It also includes making high quality service available regardless of geographic location or other restrictions such as disability.

Constellations of hundreds of satellites in low earth orbit may soon provide telephone or data services to any point on the globe. Such systems could make universal service both practical and affordable.

An equally important part of universal access is teaching consumers how to use communications effectively. That means developing easy-to-use applications for a variety of contexts, and teaching people how to use them. The most sophisticated and cost-efficient networks will be completely useless if users are unable to understand how to access and take full advantage of their offerings.

Another dimension of universal service is the recognition that marketplace economics should not be the sole determinant of the reach of the information infrastructure.

The President and I have called for positive government action in the United States to extend the NII to every classroom, library, hospital, and clinic in the U.S. by the end of the century.

I want to urge that this conference include in its agenda for action the commitment to determine how every school and library in every country can be connected to the Internet, the world's largest computer network, in order to create a Global Digital Library. Each library could maintain a server containing books and journals in electronic form, along with indexes to help users find other materials. As more and more information is stored electronically, this global library would become more and more useful.

It would allow millions of students, scholars and businesspeople to find the information they need whether it be in Albania or Ecuador.

Private investment . . . competition . . . flexibility . . . open access . . . universal service.

In addition to urging the delegates of this conference to adopt these principles as part of the Buenos Aires Declaration, guiding the next four years of telecommunications development, I assure you that the U.S. will be discussing in many fora, inside and outside the ITU, whether these principles might be usefully adopted by all countries.

The commitment of all nations to enforcing regulatory regimes to build the GII is vital to world development and many global social goals.

But the power of the Global Information Infrastructure will be diminished if it cannot reach large segments of the world population.

We have heard together Dr. Tarjanne's eloquent speech setting forth the challenges we face. As he points out: the 24 countries of the OECD have only 16 percent of the world's population. But they account for 70 percent of global telephone mainlines and 90 percent of mobile phone subscribers.

There are those who say the lack of economic development causes poor telecommunications. I believe they have it exactly backwards. A primitive telecommunications systems causes poor economic development.

So we cannot be complacent about the disparity between the high and low income nations, whether in how many phones are available to people or in whether they have such new technologies as high speed computer networks or videoconferencing.

The United States delegation is devoted to working with each of you at this Conference to address the many problems that hinder development.

And there are many. Financing is a problem in almost every country, even though telecommunications has proven itself to be an excellent investment.

Even where telecommunications has been identified as a top development priority, countries lack trained personnel and up-to-date information.

And in too many parts of the world, political unrest makes it difficult or impossible to maintain existing infrastructure, let alone lay new wire or deploy new capacity.

How can we together to overcome these hurdles? Let me mention a few things industrialized countries can do to help.

First, we can use the Global Information Infrastructure for technical collaboration between industrialized nations and developing countries. All agencies of the U.S. government are potential sources of information and knowledge that can be shared with partners across the globe.

The Global Information Infrastructure can help development agencies link experts from every nation and enable them to solve common problems. For instance, the Pan American Health Organization has conducted hemisphere-

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wide teleconferences to present new methods to diagnose and prevent the spread of AIDS.

Second, multilateral institutions like the World Bank, can help nations finance the building of telecommunications infrastructure.

Third, the U.S. can help provide the technical know-how needed to deploy and use these new technologies. USAID and U.S. businesses have helped the U.S. Telecommunications Training Institute train more than 3500 telecommunications professionals from the developing world, including many in this room.

In the future, USTTI plans also to help businesspeople, bankers, farmers, and others from the developing world find ways that computer networking, wireless technology, satellites, video links, and other telecommunications technology could improve their effectiveness and efficiency.

I challenge other nations, the development banks, and the UN system to create similar training opportunities.

The head of our Peace Corps, Carol Bellamy, intends to use Peace Corps volunteers both to help deploy telecommunications and computer systems and to find innovative uses for them. Here in Argentina, a Peace Corps volunteer is doing just that.

To join the GII to the effort to protect and preserve the global environment, our Administration will soon propose using satellite and personal communication technology to create a global network of environmental information. We will propose using the schools and students of the world to gather and study environmental information on a daily basis and communicate that data to the world through television.

But regulatory reform must accompany this technical assistance and financial aid for it to work. This requires top-level leadership and commitment—commitment to foster investment in telecommunications and commitment to adopt policies that ensure the rapid deployment and widespread use of the information infrastructure.

I opened by quoting Nathaniel Hawthorne, inspired by Samuel Morse's invention of the telegraph.

Morse was also a famous portrait artist in the U.S. — his portrait of President James Monroe hangs today in the White House. While Morse was working on a portrait of General Lafayette in Washington, his wife, who lived about 500 kilometers away, grew ill and died. But it took seven days for the news to reach him.

In his grief and remorse, he began to wonder if it were possible to erase barriers of time and space, so that no one would be unable to reach a loved one in time of need. Pursuing this thought, he came to discover how to use electricity to convey messages, and so he invented the telegraph and, indirectly, the ITU.

The Global Information Infrastructure offers instant communication to the great human family.

It can provide us the information we need to dramatically improve the quality of their lives. By linking clinics and hospitals together, it will ensure that doctors treating patients have access to the best possible information on diseases and treatments. By providing early warning on natural disasters like volcanic eruptions, tsunamis, or typhoons, it can save the lives of thousands of people.

By linking villages and towns, it can help people organize and work together to solve local and regional problems ranging from improving water supplies to preventing deforestation.

To promote ... to protect ... to preserve freedom and democracy, we must make telecommunications development an integral part of every nation's development. Each link we create strengthens the bonds of liberty and democracy around the world. By opening markets to stimulate the development of the global information infrastructure, we open lines of communication.

By opening lines of communication, we open minds. This summer, from my country cameras will bring the World Cup Championship to well over one billion people.

To those of you from the 23 visiting countries who teams are in the Finals, I wish you luck—although I'll be rooting for the home team.

The Global Information Infrastructure carries implications even more important than soccer.

It has brought us images of earthquakes in California, of Boris Yeltsin on a tank in Red Square, of the effects of mortar shells in Sarajevo and Somalia, of the fall of the Berlin Wall. It has brought us images of war and peace, and tragedy and joy, in which we all can share.

There's Dutch relief worker, Wam Kat, who has been broadcasting an electronic diary from Zagreb for more than a year and a half on the Internet, sharing his observations of life in Croatia.

After reading Kat's Croatian diary, people around the world began to send money for relief efforts. The result: 25 houses have been rebuilt in a town destroyed by war.

Governments didn't do this. People did. But such events are the hope of the future.

When I began proposing the NII in the U.S., I said that my hope is that the United States, born in revolution, can lead the way to this new, peaceful revolution. However, I believe we will reach our goal faster and with greater certainty if we walk down that path together. As Antonio Machado, Spanish poet, once said, "Pathwalker, there is no path, we create the path as we walk."

Let us build a global community in which the people of neighboring countries view each other not as potential enemies, but as potential partners, as members of the same family in the vast, increasingly interconnected human family.

Let us seize this moment. Let us work to link the people of the world. Let us create this new path as we walk it together.

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American Red Cross

National Headquarters
Washington, DC 20006

April 21, 1994

Ms Judith D. Corse
Manager, Marketing Program Development
IRIDIUM Incorporated
1410 H Street NW
Washington, DC 20005

Dear Judy:

My colleagues and I of the American Red Cross are grateful to you for the demonstration of Iridium's low earth orbit satellite communication system. Such a system would clearly assist us as we deliver emergency medical and other humanitarian relief to geographically dispersed areas both in the US and overseas.

The greatest need for our services frequently arises in areas where ready access to communications systems is lacking, either because the communications infrastructure has been destroyed by an event of calamitous proportions or because it is simply inadequate. Further, our time-sensitive operations are often hindered by the difficulty of promptly reporting the occurrence of a hazardous or life-threatening situation and coordinating the humanitarian assistance required with governmental, international, and private voluntary agencies. In addition, communicating with large numbers of geographically dispersed relief personnel, constantly on the move, has proven yet another obstacle to our operations.

The system you have demonstrated would suit our operations in two ways.

> First, the availability of a hand held communications device, that facilitates ready response, is central to our operating requirements. The ability to dispatch a team of relief personnel, that can instantaneously establish a communications link not affected by damage to the local infrastructure, is an extremely critical attribute, one that would undoubtedly save time, therefore lives, and money. As my colleagues and I understand the technology, low earth orbit satellites would enable truly portable hand-held voice communication.

Second, the ability to communicate with geographically dispersed personnel, who are not stationery, is a another central operating requirement of the American Red Cross. A single phone number would be ideal to reach the relief worker, wherever he or she may be. We understand, from your demonstration, that a hand held instrument, such as Motorola's Iridium handset, would assure constant communications and reduce, if not eliminate, the amount of time we are out of contact with our field staff during critical periods. We further understand that low earth orbit satelllites, with geolocation, would permit this beneficial level of communication to mobile relief workers from a central location and, just as importantly, from one mobile relief worker to another.

My colleagues and I wish you every success in securing the apppropriate governmental authorization to implement this admirable system. Please feel free to use this letter, in that process, as you may see fit.

Sincerely,

Jose A. Aponte
General Manager
International Services

7

U.S. Department of Transportation
Office of the Secretary of Transportation

400 Seventh St., S.W.
Washington, D.C. 20590

MAR 31 1994

Dear Colleague:

Following a February 10, 1994 public meeting to obtain information on the Low Earth Orbit (LEO) commercial satellite and launch vehicle market, Office of Commercial Space Transportation (OCST) staff prepared the enclosed projections of the number of small commercial satellites to be launched in the period 1994-2005. A discussion of the related demand for LEO launch services is provided in the accompanying text, along with assumptions used in developing the projections.

This information was developed to assist OCST in supporting a variety of Administration efforts, including Interagency Working Groups on U.S. space transportation. Our intent was to clarify near-term commercial space transportation needs for launching small satellites (under 3,000 pounds at launch) to LEO. Due to the uncertainty and evolving nature of this market segment, OCST will be preparing updated projections as new information becomes available.

I appreciate all of the input and assistance provided to facilitate this effort.

Sincerely,

Frank C. Weaver

Frank C. Weaver
Director, Office of Commercial
Space Transportation

Enclosure

LEO Commercial Payload Projections

The attached charts contain projections of the Low Earth Orbit (LEO) commercial payload market for the period between 1994 and 2005. The information in the charts was developed by the Department of Transportation's (DOT) Office of Commercial Space Transportation (OCST) on the basis of inputs received at a February 10, 1994 public meeting attended by small satellite manufacturers and launch services providers, among others, as well as public information and OCST research. Due to the dynamic and uncertain nature of this market segment, efforts will be made regularly to update the projections and/or account for new activities.

The results presented in this study do not indicate DOT support for any particular proposal or system. Rather, the information provided reflects an OCST assessment of aggregate data obtained for purposes of projecting future space transportation needs to LEO.

Proposed LEO Communications Systems Table 1 provides a listing of the various publicly announced proposals for LEO communications systems currently under development within the industry. The systems are listed as "Mega," "Big," or "Little" LEO constellations, depending on the capabilities provided by the system. Little LEOs would provide mobile messaging and position location services, while Big LEOs would add mobile voice and fax capabilities; Mega LEOs would provide wireless video, voice, and high-speed data services on small satellite dishes. Such a list is critical to a study of the potential size of the LEO satellite and/or small vehicle launch market, as LEO constellations will in all likelihood provide the highest level of demand for satellites and launch services for this market segment.

Market Scenarios Despite the number and range of systems identified in Table 1, it seems clear that the market cannot support all of the proposed systems listed in the chart, and that some proposals may never mature into deployed systems. Accordingly, Tables 2 and 3 present OCST staff projections of small commercial satellite demand under two different scenarios, with three market segments identified for each scenario (Big LEO communications systems, Little LEO communications systems, and the more general category of remote sensing, international scientific, and microgravity payloads). For clarity, the charts also contain a separate projection of failure replacement/Operations & Maintenance (O&M) payloads for both classes of LEO systems.

The primary difference between the two market scenarios consists of the number of Big LEO systems projected for deployment: Scenario 1 projects one deployed Big LEO system, while Scenario 2 predicts two deployed Big LEO systems. Both scenarios project that one Little LEO system will ultimately be deployed. Mega LEO systems have not been included in either scenario at this time due to the more recent evolution of such proposals and the unusual challenges involved in their design, deployment, and financing. However, close attention will be paid to such proposals as the projections presented in this document are updated in coming months. The projection of two to three deployed LEO systems over the next decade was based in part on certain assumptions concerning:

1) the projected customer market for personal communications services;

2) the potential effect of various competing technologies (e.g., cellular phones, GEO-based mobile communications services) on that market;

3) potential limitations on the availability of capital for such projects; and

4) the government authorization/licensing process and the related congestion at the various frequencies necessary for LEO systems.

The projections and deployment schemes provided for Big and Little LEO systems in the two scenarios are representative of the characteristics described in various proposals currently under consideration by industry, and are not intended to signify OCST support for any individual system or proposal.

<u>Launch Demand</u> An assessment of the launch schemes for the various LEO constellations indicates that most Big LEO proposers currently plan to deploy the bulk of their satellites on medium-to-large commercial launch vehicles (capable of launching 10,000 to 20,000 pounds to LEO). However, Big LEO proposers apparently intend to conduct at least some portion of their replacement launches on small launch vehicles, usually in clusters of two or three satellites.

Little LEO proposers currently intend to conduct both deployment and replacement launches on small launch vehicles due to the relatively small size of these payloads. Also, organizations planning remote sensing, international scientific, or microgravity payloads will most likely use single-manifested small launch vehicles.

Based on these assumptions, the resulting Scenario 1 demand for launches to LEO for the period between 1994 and 2005 should be approximately:

- 4 to 8 medium-to-large launches per year *during deployment phases* (1996-1998, 2002-2003), depending on the system and the particular launch scheme; and

- 8 to 12 small vehicle launches per year (with only four launches occurring in 1994).

The resulting Scenario 2 demand for LEO launches for the same period should be approximately:

- 5 to 10 medium-to-large launches per year during deployment phases (1996-1998, 2002-2005); and

- 8 to 12 small vehicle launches per year, as in the case of Scenario 1 (with only four launches occurring in 1994).

Based on available information, the competitions for these launches should in most cases be open to bids from U.S. commercial launch providers.

Table 1

PROPOSED LEO COMMUNICATION SATELLITE SYSTEMS[3]

TYPE	SYSTEM	OPERATOR	MANUFACTURER	No. OF SATELLITES	PAYLOAD MASS (lbs) [1]	DEVELOPMENT COST ($B)	PROPOSED 1st LAUNCH [2]
"MEGA" LEO	Teledesic	Teledesic Corp.	TBD	840 (+84)	1716	9	1999
BIG LEO	Aries	Constellation Comm.	D.S.I.	48	400	0.4	1995
	Ellipso	Ellipsat	Fairchild	14 - 18	385	0.6	1996
	Globalstar	Loral Qualcomm	SS/Loral	48	836	1.7	1997
	Iridium	Motorola	Lockheed	66	1500	3.4	1996
	Odyssey (4)	TRW	TRW	12	2500	1.3	1997
	Signal (Glonass)	Russia	NPO Energia	48	680	UNK	TBD
LITTLE LEO	LEO One	LEO One Panamericana	D.S.I.	12 - 36	350	UNK	1995
	Orbcomm	Orbital Comm.	Orbital Sciences	36	87	0.14	1994
	Starnet	Starsys	D.S.I.	24	TBD	0.15	1996
	Taos [4]	CNES	Matra Marconi	12	330	UNK	1995
	Vitasat	VITA	Surrey Sat.	2	100	UNK	1995-96

(1) The proposals for Big LEO systems generally entail initial deployment in clusters on large vehicles. Failure replacement/O & M launches would in most cases utilize small launch vehicles. The systems generally assume a satellite failure rate of approximimtely 10%.

(2) The proposals typically call for deployment in 2 to 3 years.

(3) The Inmarsat Project 21 effort is not included because Inmarsat has chosen to use intermediate circular or GEO orbits for the system.

(4) These foreign LEO systems would probably be launched on foreign launch vehicles.

Table 2

LEO COMMERCIAL PAYLOAD PROJECTIONS (SCENARIO 1) [1]

MARKET SEGMENT	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Big LEO			21	43	9	0	0	0	43	30	0	0
Little LEO	2	24	10			18	18				18	18
Big/Little LEO "O & M" Support [2]			3	0	8	8	11	8	8	8	8	11
Remote Sensing/ Int'l Scientific/ Microgravity [3]	3	4	6	7	4	2	3	7	5	6	2	5
TOTAL:	5	28	40	50	21	28	32	15	56	44	28	34

NOTES:

1. Scenario 1 assumes that one Big LEO and one Little LEO system will become operational. The projections and deployment schemes shown are representative of current proposals for LEO systems.

2. Numbers are approximations based on estimates of satellite failure rates for the two systems.

3. Where appropriate, a 5-year on-orbit life cycle/system replacement phase was assumed for these classes of payloads. U.S. Government military and civil payloads have not been included.

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Table 3

LEO COMMERCIAL PAYLOAD PROJECTIONS (SCENARIO 2) (1)

MARKET SEGMENT	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Big LEO(s)			21	67	33	0	0	0	43	30	24	24
Little LEO	2	24	10			18	18				18	18
(2) Big/Little LEO "O & M" Support			3	0	13	8	11	8	8	8	8	16
(3) Remote Sensing/ Int'l Scientific/ Microgravity	3	4	6	7	4	2	3	7	5	6	2	5
TOTAL:	5	28	40	74	50	28	32	15	56	44	52	63

NOTES:

1. Scenario 2 assumes that two Big LEO and one Little LEO system will become operational. The projections and deployment schemes shown are representative of current proposals for LEO systems.

2. Numbers are approximations based on estimates of satellite failure rates for the three systems.

3. Where appropriate, a 5-year on-orbit life cycle/system replacement phase was assumed for these classes of payloads. U.S. Government military and civil payloads have not been included.

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8

AGREEMENT

between the GLONASS Administration and IUCAF concerning frequency usage by GLONASS-M and the Radio Astronomy Service

The delegation of the GLONASS Administration and the delegation of the Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (IUCAF), meeting in Moscow on 2-4 November 1993,

Considering

- the conclusions of their meetings in Moscow in October 1991, June 1992 and November 1993;

- the results of the Joint GLONASS-Radio Astronomy Experiment in November 1992, and the technical evaluation of the experiment by Working Party 7D of the Radiocommunication Sector of the ITU in April 1993;

- the organizational and technical measures implemented by the GLONASS Administration in September 1993;

- the bilateral agreements reached in September 1993 between the administration of the Russian Federation and the administrations of Australia and Japan, and the summary record of the meeting in October 1993 between the administrations of the Russian Federation and the United States of America;

and noting

- the impact of the GLONASS-M satellite system on radio astronomical measurements in the bands 1610.6-1613.8 MHz and 1660-1670 MHz, and the continuing implementation of the GLONASS-M satellite system; and

- the technical difficulties in achieving electromagnetic compatibility between the GLONASS-M system and the Radio Astronomy Service;

agree that:

1. the GLONASS Administration shall continue to exclude the main emission of the 1M02G7X class (GLONASS: narrow band) from the band 1610.6-1613.8 MHz, and from 1999 will exclude the main emission of 10M2G7X class (GLONASS-M: broad band);

2. during the period 1994-1998 filters will be installed on the newly developed GLONASS-M spacecraft to reduce the levels of out-of-band emissions in the frequency band 1660-1670 MHz below the levels specified in CCIR Report 224;

3. the GLONASS Administration undertakes to communicate to IUCAF any changes in the orbital parameters and frequencies of the GLONASS system, as soon as practicable, in order to assist in the planning of radio astronomy observations to avoid the interference caused by GLONASS;

4. IUCAF undertakes to communicate information on the GLONASS system to the radio astronomy community, to advise the radio astronomy community on optimal times to observe, and to coordinate further joint experiments as needed to evaluate the compatibility of the GLONASS system with the Radio Astronomy Service. The coordination will be done by the IUCAF coordinator at Arecibo Observatory in the first instance;

5. GLONASS Administration undertakes to investigate the optimal assignment of frequencies among the GLONASS-M satellites, within the constraints of existing technical limitations, so as to minimize the impact on the radio astronomical observations;

6. the GLONASS administration agrees to investigate the ways of reducing out-of-band emissions in the frequency band 1610.6-1613.8 MHz to the levels indicated in CCIR Report 224, and to communicate their proposed solution of this problem at a future meeting;

7. a solution of the interference problem caused by the main emission of class 10M2G7X and out-of-band emissions of GLONASS transmitters in the frequency band 1610.6-1613.8 MHz will be achieved only if the frequency plans of the GLONASS and GLONASS-M systems are modified. IUCAF agrees to assist in the coordination of the necessary changes with the interested administrations and with the ITU.

Both delegations believe that the implementation of the above agreements is a sufficient basis to achieve compatibility between the GLONASS system and the Radio Astronomy Service, and that coordination between GLONASS, GLONASS-M and the Radio Astronomy Service is possible.
This information shall be communicated to the ITU and to interested administrations within one month.

The agreement is written in Russian and in English, and both versions have equal standing. The agreement will come into force at the moment of signing.

On behalf of the GLONASS Administration

General Vladimir I. Durnev

Head of GLONASS delegation

On behalf of IUCAF

Dr. Willem A. Baan

Head of IUCAF delegation

Moscow, 4th November 1993.

MEMBERSHIP OF THE RUSSIAN DELEGATIONS

1. Vladimir I. Durnev

"GLONASS" administration

2. Victor V. Gorev
3. Michael G. Lebedev
4. Vladimir F. Cheremisin
5. Michael B. Vasilyev
6. Dmitry A. Fedoseev
7. Andrew N. Sergeev
8. Valery V. Tubalin
9. Nina D. Labusova
10. Nikita P. Grigoryev

Ministry of Communication

11. Valery V. Butenko
12. Alla G. Russkikh
13. Dmitry U. Funtov
14. Sergey S. Borisov

[illegible] and Terrestrial
Services(Japan)

11.1 Coordination between GLONASS-M and Japanese Radio Astronomy in the band 1596.9-1620.6MHz

Taking account of the possibility of harmful interference caused in Japanese radio astronomy observations by transmission from GLONASS-M. Japanese delegation requested the Russian delegation to take the following actions.

Nominal channel number specified here is based on the channel arrangement for the GLONASS-M system provided by Russian delegation as shown in attachment (ANNEX-3-R-2).

1) As an urgent first step (not later than 1998), the GLONASS-M system should be restricted to use the lower twelve frequency channels of the present configuration (center frequencies are lower than 1608.1875 MHz).

2) As a second step (as early as possible), the twelve frequency channels of the GLONASS-M system should be shifted down in frequency to channels six and lower (center frequencies are lower than 1604.8125 MHz).

3) As soon as practicable (not later than 1998), the GLONASS-M system should employ filtering above the first sideband of the highest frequency channel use in order to cut off the out-of-band interference to Japanese radio astronomy service.

4) Operations in the frequency channels from seven to twelve of the GLONASS-M system should be restricted to narrow-band mode (whose occupied frequency bandwidth is ± 0.5MHz) only.

5) The GLONASS-M system should employ a new modulation scheme in order to reduce the out-of-band harmful interference to Japanese radio astronomy services.

6) In case of occurring the harmful interference in Japanese radio astronomy observations, all necessary and appropriate actions should be done in operation of the GLONASS-M system including the suspension of the transmissions in question taking account of the RR footnote 734 and new 734 modified in WARC-92.

For the items 1) and 2), which are also appeared in the CCIR-WP/7D report (5 April 1993), the Russian delegation agreed to the requests.

For the item 4), the Russian delegation agreed that the operation of the GLONASS-M system with wide-band mode (whose occupied frequency bandwidth is ± 5MHz) should be restricted to as seldom as possible.

Both delegations agreed that neccssary steps must be taken with a view to protecting Japanese radio astronomy service from harmful interference caused by the GLONASS-M system which includes the out-of-band interference as well as in-band(1610.6-1613.8MHz) one in accordance with the RR 734 and new 734.

Both delegations also recognized further studies should be continued for the possible frequency sharing methods (e.g. optimum scheduling of radio astronomy observations and techniques to reduce the harmful interference such as new modulation scheme C.P.M (Continuous Phase Modulation).

Both delegations considered the coordination between GLONASS-M and Japanese radio astronomy service in 1596.9-1620.6MHz was completed under the above all mutual agreements and recognition.

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INSIDE

RTCA TO FAA— Report Your Present Position in the GPS Program

by Dick Arnold, Director, GPS, Communications, Navigation and Surveillance Systems, Federal Aviation Administration

Dave Watrous asked me to give a position report on where we are in the GPS communications, navigation and surveillance program for his readers and to describe my job in the overall FAA GPS/CNS program.

If you've been around aviation a while, you may remember flying in the system before radar. Do you remember the old position report format: "Identification, position, altitude, ETA to next reporting point, and the succeeding reporting point"? What I'll try to do is give you a GPS position report in the old reporting format--there is an older format: Id, position, altitude, airspeed, destination, etc., but I won't press your memory. That one was used, as Dave will remember, before there were reliable landlines.

Identification. First is my identification. About three (3) months ago, the FAA Administrator appointed me to my current position. I've been around Nav and Landing since 1985 from a programmatic standpoint and have been flying precision approaches since 1955 and Radio Range Orientations, Let Downs and Low Approaches before that. Does anyone recall doing a frozen loop orientation, etc.? Oh well, back to business. (page 3)